

---

Meridian 1

# Summary of transmission parameters

---

Document Number: 553-2201-182  
Document Release: Standard 10.00  
Date: July 1995

---

© 1984, 1995  
All rights reserved

Printed in Canada

Information is subject to change without notice. Northern Telecom reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules.

SL-1 and Meridian 1 are trademarks of Northern Telecom.

---

## Revision history

---

**February 28, 1990**

Standard, release 2.0. Reissued for compliance with Northern Telecom standard 164.0.

**October 19, 1990**

Standard, release 3.0. This document has been updated to include information on Meridian Modular Telephones transmission parameters.

**July 28, 1991**

Standard release 4.0. Reissued to reflect recent loss plan changes in conjunction with Release 18 analog line cards; to incorporate loss tables for non-VNL options; and to incorporate port to port loss values for conference connections.

**December 1, 1991**

Standard, release 5.0. This document is reissued to include technical content updates.

**December 31, 1992**

Standard, release 6.0. This document is reissued to update the list of applicable system types.

**April 1, 1993**

Standard, release 7.0. This document is reissued to incorporate a technical correction.

**April 1, 1994**

Standard, release 8.0. This document is reissued to included editorial revisions.

**December 1994**

Standard, release 9.0. This document is reissued to include changes to the loss plan tables and editorial revisions. Changes are noted by revision bars in the margin.

**July 1995**

Standard, release 10.00. This document is reissued to include Option 81C switch and editorial revisions. Changes are noted by revision bars in the margin.

---

# Contents

---

|                                                                |           |
|----------------------------------------------------------------|-----------|
| <b>About this document</b> .....                               | <b>1</b>  |
| References .....                                               | 2         |
| <b>Loss plan</b> .....                                         | <b>3</b>  |
| Loss plan for $\mu$ -Law applications .....                    | 4         |
| General .....                                                  | 4         |
| Trunk options .....                                            | 5         |
| Loss plan specifications .....                                 | 6         |
| Loss plan for conference connections .....                     | 16        |
| Loss plan for A-Law applications .....                         | 17        |
| <b>Transmission characteristics—<math>\mu</math>-Law</b> ..... | <b>19</b> |
| Transmission characteristics for IPE .....                     | 19        |
| Frequency response .....                                       | 19        |
| Overload level .....                                           | 20        |
| Tracking error (gain variation with level) .....               | 21        |
| Return loss .....                                              | 22        |
| Transhybrid loss .....                                         | 24        |
| Input impedance .....                                          | 26        |
| Idle channel noise .....                                       | 27        |
| Longitudinal balance .....                                     | 28        |
| Crosstalk .....                                                | 29        |
| Quantization distortion .....                                  | 30        |
| Intermodulation distortion .....                               | 31        |
| Envelope delay .....                                           | 32        |
| Impulse noise .....                                            | 33        |
| Echo path delay .....                                          | 33        |

|                                                                              |           |
|------------------------------------------------------------------------------|-----------|
| Transmission characteristics for PE . . . . .                                | 34        |
| Overload level . . . . .                                                     | 34        |
| Return loss . . . . .                                                        | 35        |
| Transhybrid loss . . . . .                                                   | 35        |
| Input impedance . . . . .                                                    | 35        |
| <b>Transmission characteristics—A-Law . . . . .</b>                          | <b>37</b> |
| Transmission characteristics for IPE . . . . .                               | 37        |
| Frequency response . . . . .                                                 | 37        |
| Overload level . . . . .                                                     | 38        |
| Tracking error (gain variation with level) . . . . .                         | 39        |
| Return loss . . . . .                                                        | 40        |
| Idle channel noise . . . . .                                                 | 42        |
| Longitudinal balance . . . . .                                               | 43        |
| Crosstalk . . . . .                                                          | 44        |
| Quantization distortion . . . . .                                            | 44        |
| Intermodulation distortion . . . . .                                         | 45        |
| Envelope delay . . . . .                                                     | 45        |
| Impulse noise . . . . .                                                      | 46        |
| Echo path delay . . . . .                                                    | 46        |
| Spurious in-band . . . . .                                                   | 47        |
| Spurious out-of-band . . . . .                                               | 47        |
| Discrimination against out-of-band signals . . . . .                         | 47        |
| Transmission characteristics for PE . . . . .                                | 48        |
| <b>Transmission parameters for<br/>Meridian Modular Telephones . . . . .</b> | <b>49</b> |
| Receive and transmit objective loudness rating . . . . .                     | 50        |
| Sidetone objective loudness rating . . . . .                                 | 54        |
| <b>List of terms . . . . .</b>                                               | <b>55</b> |

---

## List of figures

---

|                                        |    |
|----------------------------------------|----|
| Figure 1                               |    |
| Compromise impedance network . . . . . | 24 |

---

## List of tables

---

|                                                                  |    |
|------------------------------------------------------------------|----|
| Table 1                                                          |    |
| Electrical loss—IPE ports to IPE ports . . . . .                 | 9  |
| Table 2                                                          |    |
| Electrical loss—digital ports to IPE ports . . . . .             | 11 |
| Table 3                                                          |    |
| Electrical loss—digital port to digital ports . . . . .          | 11 |
| Table 4                                                          |    |
| Electrical loss—IPE ports to PE ports . . . . .                  | 12 |
| Table 5                                                          |    |
| Electrical loss—digital ports to PE ports . . . . .              | 13 |
| Table 6                                                          |    |
| Electrical loss—PE ports to PE ports . . . . .                   | 14 |
| Table 7                                                          |    |
| Insert loss tolerance . . . . .                                  | 15 |
| Table 8                                                          |    |
| Loss insertion for conference connections . . . . .              | 16 |
| Table 9                                                          |    |
| Frequency response— $\mu$ -Law . . . . .                         | 19 |
| Table 10                                                         |    |
| Overload level— $\mu$ -Law . . . . .                             | 20 |
| Table 11                                                         |    |
| Tracking error (gain variation with level)— $\mu$ -Law . . . . . | 21 |
| Table 12                                                         |    |
| Return loss—design parameter values— $\mu$ -Law . . . . .        | 22 |

---

|                                                               |    |
|---------------------------------------------------------------|----|
| Table 13                                                      |    |
| Return loss—in-service parameter values— $\mu$ -Law . . . . . | 23 |
| Table 14                                                      |    |
| Transhybrid loss— $\mu$ -Law . . . . .                        | 25 |
| Table 15                                                      |    |
| Input impedance— $\mu$ -Law . . . . .                         | 26 |
| Table 16                                                      |    |
| Idle channel noise— $\mu$ -Law . . . . .                      | 27 |
| Table 17                                                      |    |
| Longitudinal balance— $\mu$ -Law . . . . .                    | 28 |
| Table 18                                                      |    |
| Crosstalk— $\mu$ -Law . . . . .                               | 29 |
| Table 19                                                      |    |
| Quantization distortion— $\mu$ -Law . . . . .                 | 30 |
| Table 20                                                      |    |
| Intermodulation distortion— $\mu$ -Law . . . . .              | 31 |
| Table 21                                                      |    |
| Relative envelope delay— $\mu$ -Law . . . . .                 | 32 |
| Table 22                                                      |    |
| Echo path delay— $\mu$ -Law . . . . .                         | 33 |
| Table 23                                                      |    |
| Overload level— $\mu$ -Law . . . . .                          | 34 |
| Table 24                                                      |    |
| Frequency response—A-Law . . . . .                            | 37 |
| Table 25                                                      |    |
| Overload level—A-Law . . . . .                                | 38 |
| Table 26                                                      |    |
| Tracking error (gain variation with level)—A-Law . . . . .    | 39 |
| Table 27                                                      |    |
| Return loss—in-service parameter values—A-Law . . . . .       | 40 |



|                                                                                     |    |
|-------------------------------------------------------------------------------------|----|
| Table 28                                                                            |    |
| Return loss—in-service attenuation—A-Law . . . . .                                  | 41 |
| Table 29                                                                            |    |
| Idle channel noise—A-Law . . . . .                                                  | 42 |
| Table 30                                                                            |    |
| Longitudinal balance—A-Law . . . . .                                                | 43 |
| Table 31                                                                            |    |
| Crosstalk—A-Law . . . . .                                                           | 44 |
| Table 32                                                                            |    |
| Quantization distortion—A-Law . . . . .                                             | 44 |
| Table 33                                                                            |    |
| Relative envelope delay—A-Law . . . . .                                             | 45 |
| Table 34                                                                            |    |
| Impulse noise—A-Law . . . . .                                                       | 46 |
| Table 35                                                                            |    |
| Echo path delay—A-Law . . . . .                                                     | 46 |
| Table 36                                                                            |    |
| Spurious in-band image signals—A-Law . . . . .                                      | 47 |
| Table 37                                                                            |    |
| Spurious out-of-band image signals—A-Law . . . . .                                  | 47 |
| Table 38                                                                            |    |
| Discrimination against out-of-band signals—A-Law . . . . .                          | 47 |
| Table 39                                                                            |    |
| Receive and transmit transmission parameters (North America) . . . . .              | 51 |
| Table 40                                                                            |    |
| Handset receive and transmit transmission parameters<br>(international) . . . . .   | 52 |
| Table 41                                                                            |    |
| Handsfree receive and transmit transmission parameters<br>(international) . . . . . | 53 |
| Table 42                                                                            |    |
| Allowable SOLR values . . . . .                                                     | 54 |

::Illustrations:illustration files:2000-2199:553-2082.eps 24

---

# Contents

---

|                                                                |           |
|----------------------------------------------------------------|-----------|
| <b>About this document</b> .....                               | <b>1</b>  |
| References .....                                               | 2         |
| <b>Loss plan</b> .....                                         | <b>3</b>  |
| Loss plan for $\mu$ -Law applications .....                    | 4         |
| General .....                                                  | 4         |
| Trunk options .....                                            | 5         |
| Loss plan specifications .....                                 | 6         |
| Loss plan for conference connections .....                     | 16        |
| Loss plan for A-Law applications .....                         | 17        |
| <b>Transmission characteristics—<math>\mu</math>-Law</b> ..... | <b>19</b> |
| Transmission characteristics for IPE .....                     | 19        |
| Frequency response .....                                       | 19        |
| Overload level .....                                           | 20        |
| Tracking error (gain variation with level) .....               | 21        |
| Return loss .....                                              | 22        |
| Transhybrid loss .....                                         | 24        |
| Input impedance .....                                          | 26        |
| Idle channel noise .....                                       | 27        |
| Longitudinal balance .....                                     | 28        |
| Crosstalk .....                                                | 29        |
| Quantization distortion .....                                  | 30        |
| Intermodulation distortion .....                               | 31        |
| Envelope delay .....                                           | 32        |
| Impulse noise .....                                            | 33        |
| Echo path delay .....                                          | 33        |

|                                                                              |           |
|------------------------------------------------------------------------------|-----------|
| Transmission characteristics for PE . . . . .                                | 34        |
| Overload level . . . . .                                                     | 34        |
| Return loss . . . . .                                                        | 35        |
| Transhybrid loss . . . . .                                                   | 35        |
| Input impedance . . . . .                                                    | 35        |
| <b>Transmission characteristics—A-Law . . . . .</b>                          | <b>37</b> |
| Transmission characteristics for IPE . . . . .                               | 37        |
| Frequency response . . . . .                                                 | 37        |
| Overload level . . . . .                                                     | 38        |
| Tracking error (gain variation with level) . . . . .                         | 39        |
| Return loss . . . . .                                                        | 40        |
| Idle channel noise . . . . .                                                 | 42        |
| Longitudinal balance . . . . .                                               | 43        |
| Crosstalk . . . . .                                                          | 44        |
| Quantization distortion . . . . .                                            | 44        |
| Intermodulation distortion . . . . .                                         | 45        |
| Envelope delay . . . . .                                                     | 45        |
| Impulse noise . . . . .                                                      | 46        |
| Echo path delay . . . . .                                                    | 46        |
| Spurious in-band . . . . .                                                   | 47        |
| Spurious out-of-band . . . . .                                               | 47        |
| Discrimination against out-of-band signals . . . . .                         | 47        |
| Transmission characteristics for PE . . . . .                                | 48        |
| <b>Transmission parameters for<br/>Meridian Modular Telephones . . . . .</b> | <b>49</b> |
| Receive and transmit objective loudness rating . . . . .                     | 50        |
| Sidetone objective loudness rating . . . . .                                 | 54        |
| <b>List of terms . . . . .</b>                                               | <b>55</b> |

---

## List of figures

---

|                                        |    |
|----------------------------------------|----|
| Figure 1                               |    |
| Compromise impedance network . . . . . | 24 |

---

## List of tables

---

|                                                                  |    |
|------------------------------------------------------------------|----|
| Table 1                                                          |    |
| Electrical loss—IPE ports to IPE ports . . . . .                 | 9  |
| Table 2                                                          |    |
| Electrical loss—digital ports to IPE ports . . . . .             | 11 |
| Table 3                                                          |    |
| Electrical loss—digital port to digital ports . . . . .          | 11 |
| Table 4                                                          |    |
| Electrical loss—IPE ports to PE ports . . . . .                  | 12 |
| Table 5                                                          |    |
| Electrical loss—digital ports to PE ports . . . . .              | 13 |
| Table 6                                                          |    |
| Electrical loss—PE ports to PE ports . . . . .                   | 14 |
| Table 7                                                          |    |
| Insert loss tolerance . . . . .                                  | 15 |
| Table 8                                                          |    |
| Loss insertion for conference connections . . . . .              | 16 |
| Table 9                                                          |    |
| Frequency response— $\mu$ -Law . . . . .                         | 19 |
| Table 10                                                         |    |
| Overload level— $\mu$ -Law . . . . .                             | 20 |
| Table 11                                                         |    |
| Tracking error (gain variation with level)— $\mu$ -Law . . . . . | 21 |
| Table 12                                                         |    |
| Return loss—design parameter values— $\mu$ -Law . . . . .        | 22 |

---

|                                                               |    |
|---------------------------------------------------------------|----|
| Table 13                                                      |    |
| Return loss—in-service parameter values— $\mu$ -Law . . . . . | 23 |
| Table 14                                                      |    |
| Transhybrid loss— $\mu$ -Law . . . . .                        | 25 |
| Table 15                                                      |    |
| Input impedance— $\mu$ -Law . . . . .                         | 26 |
| Table 16                                                      |    |
| Idle channel noise— $\mu$ -Law . . . . .                      | 27 |
| Table 17                                                      |    |
| Longitudinal balance— $\mu$ -Law . . . . .                    | 28 |
| Table 18                                                      |    |
| Crosstalk— $\mu$ -Law . . . . .                               | 29 |
| Table 19                                                      |    |
| Quantization distortion— $\mu$ -Law . . . . .                 | 30 |
| Table 20                                                      |    |
| Intermodulation distortion— $\mu$ -Law . . . . .              | 31 |
| Table 21                                                      |    |
| Relative envelope delay— $\mu$ -Law . . . . .                 | 32 |
| Table 22                                                      |    |
| Echo path delay— $\mu$ -Law . . . . .                         | 33 |
| Table 23                                                      |    |
| Overload level— $\mu$ -Law . . . . .                          | 34 |
| Table 24                                                      |    |
| Frequency response—A-Law . . . . .                            | 37 |
| Table 25                                                      |    |
| Overload level—A-Law . . . . .                                | 38 |
| Table 26                                                      |    |
| Tracking error (gain variation with level)—A-Law . . . . .    | 39 |
| Table 27                                                      |    |
| Return loss—in-service parameter values—A-Law . . . . .       | 40 |

|                                                                                     |    |
|-------------------------------------------------------------------------------------|----|
| Table 28                                                                            |    |
| Return loss—in-service attenuation—A-Law . . . . .                                  | 41 |
| Table 29                                                                            |    |
| Idle channel noise—A-Law . . . . .                                                  | 42 |
| Table 30                                                                            |    |
| Longitudinal balance—A-Law . . . . .                                                | 43 |
| Table 31                                                                            |    |
| Crosstalk—A-Law . . . . .                                                           | 44 |
| Table 32                                                                            |    |
| Quantization distortion—A-Law . . . . .                                             | 44 |
| Table 33                                                                            |    |
| Relative envelope delay—A-Law . . . . .                                             | 45 |
| Table 34                                                                            |    |
| Impulse noise—A-Law . . . . .                                                       | 46 |
| Table 35                                                                            |    |
| Echo path delay—A-Law . . . . .                                                     | 46 |
| Table 36                                                                            |    |
| Spurious in-band image signals—A-Law . . . . .                                      | 47 |
| Table 37                                                                            |    |
| Spurious out-of-band image signals—A-Law . . . . .                                  | 47 |
| Table 38                                                                            |    |
| Discrimination against out-of-band signals—A-Law . . . . .                          | 47 |
| Table 39                                                                            |    |
| Receive and transmit transmission parameters (North America) . . . . .              | 51 |
| Table 40                                                                            |    |
| Handset receive and transmit transmission parameters<br>(international) . . . . .   | 52 |
| Table 41                                                                            |    |
| Handsfree receive and transmit transmission parameters<br>(international) . . . . . | 53 |
| Table 42                                                                            |    |
| Allowable SOLR values . . . . .                                                     | 54 |